Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims

1. (Currently Amended)   An image processing method comprising the steps of:

dividing an input image into ~~plural~~ a plurality of small regions;

dividing color data in [[the]] a small region of the plurality of small regions into a specific number of groups based on the color data in the small region and reference colors in a prepared table;

extracting a representative color from each of the obtained groups; and

approximating the color data in the small region by using a specific number of the obtained representative colors.

2. (Original)   An image processing method according to claim 1 comprising the steps of:

judging, after dividing the input image into the small regions, based on a reference value obtained from the color data in the small region and the reference colors in the prepared table whether the color data in the small region should be divided into a specific number of groups by the reference colors;

in case where the color data in the small region is not divided into a specific number of groups by the reference colors according to the above judgment,

selecting a dividing target component based on distribution of color data in the small

region and then dividing the small region into groups based on specific reference;

extracting a representative color from each of the obtained groups; and

obtaining a specific number of the representative colors to approximate the color data in

the small region by repeating the steps from the selecting of the dividing target component

through the extracting of the representative colors until a specific number of the representative

colors are obtained.

3. (Currently Amended) An image processing method comprising the steps of:

dividing an input image into ~~plural~~ a plurality of small regions;

selecting plural dividing target components based on distribution of color data in [[the]] a

small region of the plurality of small regions and then dividing the color data in the small region

into a plurality of groups based on a criterion regarding the selected dividing target components;

extracting a representative color from each of the ~~obtained~~ plurality of groups; and

approximating, after repeating the steps from the selecting of the dividing target

components through the extracting of the representative colors until a specific number of the

representative colors are obtained, the color data in the small region by using the specific number

of the obtained representative colors.

4. (Currently Amended) An image processing method according to claim 3, wherein

the representative color representing ~~the group~~ each of the plurality of groups is equivalent to the

average of the color data in the group and a plurality of the dividing target components are

selected among respective components of the color data in descending order of variance against the average.

5. (Original)   An image processing method according to claim 3, wherein grades of the specific number are established, and

said method comprising the steps of:

retaining the representative colors in each grade and information for approximating the color data in the small region with the representative colors in repeating the steps from the selecting of the dividing target components through the extracting of the representative color of each group until the representative colors are obtained by a maximum number of the specific number;

when the color data in each small region is approximated by using the obtained representative colors, if a user selects either one among image quality modes,

approximating the color data in the small region by using the representative colors in each grade according to the selected mode.

6. (Currently Amended)   An image processing method comprising the steps of:

dividing an input image into ~~plural~~ a plurality of small regions;

selecting a dividing target component based on distribution of the color data in [[the]] a small region of the plurality of small regions and then dividing the color data in the small region into groups based on a criterion regarding the selected dividing target component;

subdividing each group into plural groups based on the color data in each group;

extracting a representative color from each of the obtained groups; and

approximating, after repeating the steps from the selecting of the dividing target

component through the extracting of the representative colors until a specific number of the

representative colors are obtained, the color data in the small region by using a specific number

of the obtained representative colors.

7. (Original)   An image processing method according to claim 6, comprising the steps

of:

selecting the dividing target component of which the variance against the average of the

color data is the greatest among respective components of the color data in the group; and

subdividing each group into plural groups based on a Euclid distance value between the

origin and each color data in the small region.

8. (Currently Amended)   An image processing method according to claim 3 or 6,

comprising the steps of:

judging whether sequential representative color extracting for repeating the steps from

the selecting of the dividing target component through the extracting of the representative color

from each group should be executed or not for [[the]] an objective small region, by comparing

distribution of color data in [[an]] the objective small region and that in an extracted-from region

from which the representative color has been extracted; and

in case where the sequential representative color extracting is not executed according to

the above judgment,

dividing the color data in the small region into groups based on the representative colors

representing the extracted-from region selected by the distribution of the color data in the

objective small region;

extracting a representative color from each of the obtained groups; and

approximating the color data in the small region with the obtained representative colors.

9. (Original)   An image processing method according to claim 8, wherein the above

judgment should be executed based on a similarity between a histogram of the color data in the

objective small region and a histogram of the color data in the extracted-from region.

10. (Original) An image processing method according to claim 3 or 6, wherein sequential

representative color extracting for repeating the steps from the selecting of the dividing target

component through the extracting of the representative colors until a specific number of the

representative colors are obtained is executed only for the small region selected based on a

predetermined criterion, and

for the small region not selected,

dividing the color data in the small region into plural groups based on the representative

color in an extracted-from region from which the representative color has been extracted;

extracting a representative color from each of the obtained groups; and

approximating the color data in the small region by the obtained representative colors.

11. (Original) An image processing method according to claim 3 or 6, wherein a group including all the color data in the small region is set as an initial group, and the initial group is divided into plural groups based on the criterion regarding the dividing target component.

12. (Original) An image processing method according to claim 3 or 6, wherein plural groups defined by a Euclid distance between the origin and each color data in the small region are set as initial groups, and each initial group is divided into plural groups based on the criterion regarding the dividing target component.

13. (Currently Amended) An image processor comprising:

region dividing means for dividing an input image into ~~plural~~ a plurality of small regions;

a reference color table set including a prepared set of reference colors;

color data classifying means for dividing the color data in [[the]] a small region of the plurality of small regions into a specific number of groups based on the color data in the small region and the reference colors in the table;

representative color deciding means for finding a representative color of the color data in each of the obtained groups; and

objective region approximating means for approximating the color data in each small region by using a specific number of the obtained representative colors.

14. (Currently Amended) An image processor according to claim 13, comprising summed-up variance calculating means for calculating a sum of variances from an average of the color data in each group obtained by the color data classifying means, and wherein the

representative color deciding means finds the representative color of the color data in ~~the group~~

each of the obtained groups by using the calculation result of the summed-up variance

calculating means.

15. (Original) An image processor according to claim 13, comprising:

sequential dividing reference value calculating means for calculating a dividing reference

value based on the average of the color data in each group obtained by the color data classifying

means and the reference colors used by the color data classifying means;

sequential representative color deciding means for repeating, until a specific number of

the representative colors are obtained, the dividing of an objective group into plural groups using

a criterion regarding the dividing target component selected based on distribution of the color

data in the objective group and the deciding of the representative color of each of the obtained

groups; and

sequential division judging means for judging based on the dividing reference value

whether the sequential representative color deciding means should decide the representative

color or not,

and wherein the objective region approximating means, in case where the representative

color is decided by the sequential representative color deciding means according to the judgment

of the sequential division judging means, approximates the color data in each small region by

using a specific number of the representative colors obtained by the sequential representative

color deciding means.

16. (Currently Amended)   An image processor comprising:

region dividing means for dividing an input image into ~~plural~~ a plurality of small regions;

initializing means for setting an initial group for the small region, classifying all the color data in [[the]] a small region of the plurality of small regions to the initial group, and finding the representative color of the initial group;

target component selecting means for selecting plural dividing target components to be targeted at the dividing of an objective group based on distribution of the color data in the objective group;

group dividing means for dividing the objective group into plural groups based on the obtained dividing target components and classifying the color data in the objective group to the groups obtained after the dividing;

representative color extracting means for selecting a representative color of the color data in each group obtained by the group dividing means;

termination judging means for judging whether a specific number of the representative colors are obtained or not; and

objective region approximating means for approximating, in case where, after repeating the selecting of the dividing target components by the target component selecting means, the group dividing by the group dividing means and the representative color extracting by the representative color extracting means until a specific number of the representative colors are obtained, the termination judging means judges that a specific number of representative colors are obtained, the color data in the small region by using a specific number of the obtained representative colors.

17. (Currently Amended)　　An image processor according to claim 16, wherein the target component selecting means comprises variance per component calculating means for calculating a variance between a representative color and each component of color data in an objective group, and dividing component deciding means for determine dividing target components from the components in descending order of the variance of the component obtained by the variance per ~~compact calculation~~ component calculating means.

18. (Original)　An image processor according to claim 16, comprising:

retention judging means for judging whether representative colors in respective grades established for the specific number are obtained;

graded coding retaining means for retaining, in case where the retention judging means determines the representative colors are obtained, the representative colors in the respective grades and position information for approximating the color data in the small region by using the representative colors;

user image quality selecting means for a user selecting either one among image quality modes; and

appropriate representative color reading means for reading the representative colors and the position information corresponding to the selected mode from the graded coding retaining means according to the selecting result with the user image quality selecting means; and

said image processor wherein the termination judging means judges whether a maximum specific number of the representative colors are obtained, and the objective region approximating means approximates the color data in each of the small regions by using the representative colors obtained by the appropriate representative color reading means in case where the termination

judging means determines that a maximum specific number of the representative colors are obtained.

19. (Currently Amended)   An image processor comprising:

region dividing means for dividing an input image into ~~plural~~ a plurality of small regions;

initializing means for setting an initial group for [[the]] a small region of the plurality of small regions and classifying all color data in the small region to the initial group and calculating a representative color of the initial group;

target component selecting means for selecting a dividing target component to be targeted at the dividing of an object group based on distribution of the color data in the objective group;

group dividing means for dividing the objective group into plural groups according to the obtained divided target component and classifying the color data in the objective group to the groups obtained after the dividing;

second group dividing means for subdividing each group into plural groups based on the distribution of color data in each group obtained by the above group dividing means and classifying the color data in each group into groups obtained after the dividing;

representative color extracting means for finding the representative color of the color data in each group obtained by the second group dividing means;

termination judging means for judging whether a specific number of the representative color are obtained or not; and

objective region approximating means for approximating, in case where, after repeating the selecting of the dividing target components by the target component selecting means, the group dividing by the group dividing means and by the second group dividing means, and the

representative color extracting by the representative color extracting means, the termination judging means judges that a specific number of representative colors are obtained, the color data in the small region by using a specific number of the obtained representative colors.

20. (Original) An image processor according to claim 19 wherein the second group dividing means comprises supplementary dividing reference calculating means for calculating a Euclid distance from the origin of the color data in each group obtained by the group dividing means, and group subdividing means for subdividing the group obtained by the group dividing means based on the calculation result of the supplementary dividing reference calculating means and classifying the color data in the objective group to the groups obtained after the dividing.

21. (Original) An image processor according to claim 16 or 19 comprising:

color data statistic calculating means for calculating statistic distribution of the color data in the small region;

settled representative color use judging means for judging, by comparing the statistical distribution of the color data and statistical distribution obtained from an extracted-from region from which the representative color has been extracted, whether the representative color in the extracted-from region is used or not;

similar region deciding means for selecting the extracted-from region where a similarity to the small region is the greatest;

color data classifying means for dividing the color data in the small region into a specific number of groups based on the color data in the small region and the representative color in the selected extracted-from region; and

simplified representative extracting means for extracting the representative color of the color data in each group obtained by the color data classifying means, and

wherein the objective region approximating means approximates the color data in each small region by using a specific number of representative colors obtained by the simplified representative color extracting means, in case where the settled representative color use judging means determined that the representative color in the extracted-from region is used.

22. (Original) An image processor according to claim 16 or 19 comprising:

sequential dividing object deciding means for selecting a region of which a representative color is decided by the representative color deciding means;

color data statistic calculating means for calculating a statistic of the color data in the small region;

adjacent similar region deciding means for comparing a statistic obtained from, of extracted-from regions from which the representative color have been extracted, an extracted-from region adjacent to a small region not selected by the sequential dividing object deciding means and the statistic in the small region, and selecting the extracted-from region with the greatest similarity to the small region; and

simplified representative extracting means for dividing the color data in an objective region into a specific number of groups based on the representative color of the extracted-from region selected by the adjacent similar region deciding means and finding the representative color in each group, and

wherein the objective region approximating means approximates the color data in each

small region not selected by the sequential dividing object deciding means by using a specific

number of representative colors obtained by the simplified representative extracting means.

23. (Original)   An image processor according to claim 16 or 19 wherein the initializing

means comprises distance calculating means for calculating a Euclid distance from the origin of

the color data in the small region, initial group dividing means for dividing all the color data in

the small region into plural groups based on the Euclid distance, and initial representative

extracting means for setting an average of the color data in each group obtained by the initial

group dividing means as the representative color in the group.

24. (Original)   An image processor according to claim 16 or 19 wherein the

representative color representing the group is an average of the color data in the group.